Bonanza Hydraulic Mining Site
Swamp Gulch
Salmon Vicinity
Lemhi County
Idaho

HAER No. ID-23

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30-SAL.V,
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Western Regional Office
National Park Service
U.S. Department of the Interior
San Francisco, California 94107

HISTORIC AMERICAN ENGINEERING RECORD

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Bonanza Hydraulic Mining Site

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I. INTRODUCTION

Location: The Bonanza Hydraulic Mining Site is situated in Swamp Gulch in the historic Leesburg mining district. The gulch, about one mile below the town of Leesburg, is a tributary of Napias Creek, about 12 miles west-northwest of Salmon, the seat of Lemhi County, Idaho.

UTM: Zone 11, 725620 E, 5011060 N
Quad: Jureano Mountain, 1989 (provisional), 7.5'

Date of Construction: 1927

Present Owner: Salmon National Forest
Salmon, Idaho 83467

Present Use: Abandoned

Significance: The Bonanza Hydraulic Mining Site is significant as an exceptionally well-preserved, early twentieth century, placer mining site. Its engineering significance is due to its exceptional integrity; the site retains the majority of its original hydraulic mining features, including the water delivery system, the mining pit itself, and tailings disposal features. In addition, the Bonanza site is important as a representation of the evolution in the use of various mining techniques and in corporate operation of placer mines in the Leesburg Basin.

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Renewable Technologies, Inc.
Butte, Montana

December 1992

II. HISTORY

A. THE LEESBURG MINING DISTRICT

The Leesburg Basin is a high mountain area in Lemhi County, east-central Idaho, which encompasses the drainage basin of Napias Creek and its tributaries.[1] The Leesburg Mining District, later known as the Mackinaw District, includes the entire basin plus the Moose Creek drainage, which begins immediately northeast of Napias Creek.

Mining in the Leesburg area began in 1866 when B.F. Sharkey, Elijah Mulkey, William Smith, Ward Girton, and Joseph Rapp left Deer Lodge, Montana Territory, on a gold prospecting trip to Idaho. The men arrived in the Leesburg Basin during the summer, and on August 12 discovered placer gold along a creek which became known as Wards Gulch. When word of the discovery leaked later that fall, the gold rush to the Leesburg Basin began. A mining district was immediately established and the community of Leesburg founded. Reportedly, 400-500 miners wintered there, amidst a small collection of businesses and houses. The basin's isolated location in the Salmon River Mountains and a long and snowy 1866-1867 winter kept the number of prospectors relatively low until the following spring when between 3000 and 7000 people moved to the newly-formed mining district. The new arrivals were greeted by a booming mining camp where about 130 buildings were standing or in the process of being built.[2]

Though tempered by the sobering reality of the mountain climate, boulders in some of the placer ground, and only modest gold recovery, the Leesburg boom continued through 1867 and 1868. Production in 1868 reached about $750,000 or three times that of the previous year.[3]

Both individuals and small companies conducted mining during Leesburg's first years. The latter included the Discovery Company which was formed by the five men who initially found gold in the basin and reportedly operated for 10 years. Most of the early claims were worked by hand, although a few hydraulic (giant) mines operated during the latter part of the nineteenth century.[4]

The excitement of the Loon Creek, Yellowjacket, and other discoveries in central Idaho in the late 1860s spelled the end of the Leesburg boom, but not the end of placer mining. By 1870, Leesburg's population dropped to 175.[5] After departure of most of the Euro-Americans, Chinese placer miners took over many of the Leesburg claims. A handful of Chinese remained in the area well into the twentieth century.[6] Although there is a paucity of records from this period (1870-1900), production appears to have been limited.

While other camps in central Idaho revived after the placer mining bust with the discovery and development of lode claims, such was not the case at Leesburg. Between 1901 and 1954, lode mines accounted for less than 15 percent of all mineral production in the basin. The Italian Mine, which commenced operations in 1892 and operated sporadically until the early 1920s, proved the most productive of the Leesburg Basin lode mines, yielding about $175,000 by 1904.[7]

Although fewer miners remained,[8] placer mining at Leesburg continued into the twentieth century, and hydraulic, drag-line, and dredge mining operations owned by corporations dominated. The most productive and impressive of the mechanical placer operations was the dredge which the Pacific Dredge Company (and later John Mullan) operated on Moose Creek between the late 1890s and 1919.[9] An estimated $1 million worth of gold was recovered by the dredge.[10] Small hydraulic and drag-line operations employed a few people between 1908 and the 1950s. Records of the Idaho Inspector of Mines, the U.S. Geological Survey, and the U.S. Bureau of Mines indicate limited production by these latter companies.[11]

Ironically, the establishment and growth of the town of Salmon is Leesburg's most important contribution to the history of Idaho. Founded as a shipping point for supplies to the town of Leesburg and its mines, the town grew rapidly. It had gained such prominence by 1869 that it was selected as the seat of the newly-formed Lemhi County. The gold rush to Leesburg also introduced this undeveloped area of central Idaho to ranchers, merchants, and other developers who were to become the mainstay of the local economy.[12]

B. OPERATIONS OF BONANZA PLACER, INC.

Among the hydraulic placer mines which were operated by corporations in the twentieth century were those of Bonanza Placer, Inc. This HAER document describes in detail the company's work at Swamp Gulch, one of its three major holdings in Leesburg Basin.

Mining of the Swamp Gulch placers began in 1926 when Frank Butschke and Dan Greenwalt visited the Leesburg area that summer, apparently with the intention of locating placer ground. By the middle of July, Butschke and Greenwalt, of Los Angeles, California, had discovered and began developing placer claims on Rapp and Napias Creeks.[13] Shortly thereafter, Carl Poulsen and his wife, also of Los Angeles, drove to the Leesburg Basin to visit the men's operation. It was apparently at this time that plans for Bonanza Placer, Inc. began to crystalize. By the end of October, the group of mining "capitalists," who would later form Bonanza Placer, Inc., had located a total of nine placer claims. The group added three other unpatented claims to these in the following year, two obtained by deed and the other by location.[14]

Bonanza Placer, Inc., incorporated on December 6, 1926, had its office in Las Vegas, Nevada. Carl A. Poulsen served as the president and manager of the corporation and Frank A. Butschke of Leesburg, as secretary. Subscribers to the first 5000 shares, Leo A. McNamee, Frances M. McNamee, and M.M. Riley, all of Las Vegas, were named Directors of the company. Stockholders included G.C. Hodson, C.E. Crews, and E. Hand of Los Angeles; Charles Bemis of San Francisco; G.B. Grinder of Yarmo, California; and others from Canada.[15]

Bonanza Placer controlled almost 1500 acres at several locations in the Leesburg Basin, including land on Camp Creek, Napias Creek from Camp Creek to Arnett Creek, Arnett Creek near the mouth of Rapp Creek, Rapp Creek itself, and in the Leesburg townsite.[16]

By January 1927, Bonanza Placer began development of its hydraulic placer mines on Swamp Gulch (a tributary of Napias Creek to the west of Jefferson Creek) and Rapp Creek. It completed a sawmill at Swamp Gulch in the spring and carpenter and blacksmith shops, dining halls, and a bunkhouse and a commissary at Swamp Gulch and Rapp Creek. Reportedly, $40,000 total was spent by the company for all development work and improvements.[17]

Actual mining began in May, with operations apparently confined to Swamp Gulch during the first season. The company's 18 employees worked in two eight-hour shifts per day. The first year they mined until the middle of October when freezing weather stopped the flow of water. The Salmon weekly newspaper, the Recorder Herald, optimistically reported good yields, hopes for paying dividends to shareholders, plans for twice as many employees in the following year, and a 25-year life for the placer grounds. It also reported the company's plans to work Swamp Gulch, Rapp Creek, and a portion of the Leesburg townsite the following year. No record of actual production for the first season is available.[18]

As hydraulicking progressed on Swamp Gulch, Bonanza continued making improvements to its water delivery system. In July, the company announced plans to build a large storage reservoir on Camp Creek, the source of its water supply. Two months later, workers completed a large storage reservoir on Swamp Gulch. At the end of the 1927 season, Bonanza boasted that "Swamp gulch has been thoroughly equipped with two pipe lines and three automatic reservoirs and one large storage reservoir ... ."[19]

In 1928, Poulsen moved to Leesburg for the summer to oversee the hydraulicking operation. During that season, the company employed 20-25 men, working in three shifts.[20] Despite the large capital outlay and the intensive labor, the Swamp Gulch operation was unsuccessful. Near the end of the season, Bonanza Placer's secretary-

treasurer, G.C. Hodson, complained of the low return and poor management at Swamp Gulch; he intended to call for the removal of all but one of the corporation's directors.[21]

In February 1929, the company reorganized and the Leesburg Bonanza Placer Company was incorporated, assuming all of Bonanza Placer's property. Its main office was in Los Angeles where its president, Carl Poulsen, resided when not living in Leesburg. Hans Therkelsen, also of Los Angeles and a board member of the old Bonanza Placers, Inc., served as the new corporation's secretary.[22] The new company, if slightly subdued by the difficulties of Bonanza Placer on Swamp Gulch, began the 1929 season with renewed energy.

> Plans for the summer's operations include the getting out of logs and building a sawmill, building two reservoirs, one on Rapps creek and one on Nappias creek, a hydro electric plant to generate power for lights and running machinery, and the installing of two rubbles elevators.[23]

Leesburg Bonanza reportedly worked Napias, Camp, and Rapps creeks with four giants that year.[24] Apparently the Swamp Gulch operation was given up as a loss.

The following year, the company recovered only about $700 worth of gold from 2000 cubic yards of material put through its plant.[25] From 1931 to 1934, the Leesburg Bonanza Placer Company performed only annual labor at its unpatented claims.[26] In the following three years, both Leesburg Bonanza and the Allied Mines and Exploration Company of Salt Lake City, Utah, filed suspension-of-work notices (in lieu of annual labor) for Leesburg Bonanza's claims.[27] This suggests that Allied had obtained an option on the property in 1934, but apparently never mined the placer ground. In March 1938, Leesburg Placer quit-claimed its rights to placer ground, all water rights, and improvements to Mary Therkelsen, Hans Therkelsen's widow. She became the sole owner of all the Bonanza claims, but never operated them.[28] Leesburg Bonanza forfeited its charter in December 1939.[29]

The failure of Bonanza Placer to continue the mining operation on Swamp Gulch over a longer period of time, such as the Goff Brothers had accomplished on upper Arnett Creek about 4½ miles to the west-northwest[30], was likely due to a lack of gold, rather than mismanagement as Secretary-Treasurer Hodson had charged. In a 1957 report, geologist Philip Shockey concluded, upon examination of the Leesburg area, that placer gold originated in granitic rock. Jefferson and Camp Creeks, tributaries on the northwest side of Napias Creek and in the vicinity of Bonanza's Swamp Gulch operation do not head in granitic rock. Alluvial deposits originating from the two creeks forced the channel of Napias Creek to the southeast, and as a consequence there is virtually no gold on the west side of the creek at this location.[31]

III. HYDRAULIC MINING

A. HISTORY

Hydraulic mining began in California in 1852 when Edward Mattison "conceived the idea of directing a stream of water under pressure against the gravel bank from a nozzle, and so doing away with the pick and bar necessary in ground sluicing and flume-waterfall work."[32] As first constructed, Mattison's invention was simply a rawhide hose with a wooden nozzle, but numerous improvements immediately followed none of which was as significant as the invention of the giant. The water pressure in the hoses reportedly posed a threat to life and limb because the hoses had a tendency to buck under high pressure, but the giant--a metal nozzle attached to metal hydraulic pipe, usually by two elbow joints--allowed greater control over the cutting water pressure. Contemporary sources identify the evolution of the giant from the goose-neck, through the Craig or globe monitor, hydraulic chief, dictator, and little giant to the hydraulic giant and monitor. All these improvements were accomplished by the turn of the century.[33]

Hydraulic mining continued through the twentieth century at least until World War II. According to Gardner and Johnson, in 1932 there were 39 hydraulic mining operations in the United States and 26 dredges. The average cubic yardage moved by dredges per month exceeded that of hydraulic operations by over 10:1.[34] Placer operations in the United States after WWII rarely if ever involved hydraulic mining methods.

While hydraulic mining offered the considerable advantage of working placer deposits with water pressure instead of the more expensive manual labor, records of production show that it was not capable of sustained yield in most areas of the Intermountain West. In fact, production in any one placer district rarely exceeded that of the earliest years of placer mining by hand.[35]

B. TECHNOLOGY

Hydraulic mining is the extraction of placer mineral deposits with water using a hydraulic giant. This method involves a water delivery system, the mining pit, and the tailings area. The constituent parts of each of these three aspect of hydraulic mining are briefly described below. These descriptions are most pertinent to small hydraulicking operations of the early twentieth century, since the Bonanza Hydraulic Mining Site, and apparently all other Leesburg area hydraulic sites, fall within that classification.

Water Delivery

Identification and selection of the source(s) of water for historic hydraulic mining and delivery of that water to a storage reservoir were of critical concern to operators.[36] Operators were cautioned by contemporary accounts to select a large watershed(s) in which abundant water would be available throughout the mining season. Experts also instructed them to base their selection of water sources on the estimated size of the deposit and therefore duration of the mining operation. Finally, a well-selected watershed was high enough above the pit to provide an adequate head of water for hydraulicking; one source recommended heads of 80-200 feet.[37]

Water flowed from its source to the reservoir by means of a ditch or flume, the former generally preferred because of its durability and the fact that it was not susceptible to fire. Throughout the Intermountain West, operators usually built flumes when rocky terrain made excavation of a ditch prohibitive, when seepage would involve a significant loss of water along the line, or at special locations along the water delivery system, such as at the upper end of the pressure box (see below).

Operators selected a slight gradient for their ditches to reduce scouring. For small operations such as that at the Bonanza Hydraulic Mining Site, ditches were small. They were ideally trapezoidal in cross-section with "sides sloping about 45°, and a water depth of one third to three quarters the bottom width."[38] Ideally, flumes lay on slight grades, although the grades could be steeper than those of ditches. Often constructed of 1½ or 2 inch rough lumber, they were composed of 12 to 16-foot sections, the overall size depending on the amount of water they were required to carry. Either tongue-and-groove lumber or battens minimized leakage.

Because most water supplies used in hydraulic mining in the Intermountain West were neither large nor permanent, water was stored in reservoirs for later use. Earthen or timber-crib dams, built with locally available materials, usually impounded these reservoirs. As with ditches, builders were cautioned to locate the structures in areas where there would be minimal water loss through evaporation and absorption and where a high head would be provided for the hydraulic giants below. Construction of a wasteway was encouraged to allow excess water to pass from the reservoir in emergency flood situations. The wasteway might be built into the dam or be a spillway around the end of the dam.[39]

Water from the storage reservoir passed through a gate in the dam to a ditch, flume, or pipe which led to a distributing reservoir. According to one source, this latter reservoir was a necessary part of the hydraulic mining operation, "acting as safety devices which protect[ed] the ditch and flumes from being overflowed ... if operations should suddenly cease."[40]

Water discharged through a gate in the distributing reservoir may have been run through a short section of flume which terminated in the pressure box. Also known as a headbox or penstock, the pressure box functioned to prevent air and sand particles from entering and damaging the supply pipe which lay below it. Usually constructed of lumber, the large, rectangular box was tall enough so that water stood at least 4 feet above the supply pipe. A sand trap lay at the bottom of the box, below the elevation of the supply pipe. If water could be discharged directly from the distributing dam into the supply pipe, a pressure box was not needed, just a trash screen and sand trap.[41]

The supply pipe was connected to the pressure box by a funnel-shaped section of pipe, with the wide section at the upstream end. The steel pipe used in the twentieth century consisted most often of sections of light-weight, riveted pipe connected with slip or stove-pipe joints. The diameter of the pipe varied, ranging from 7 to 46 inches. The pipe led directly to the pit with a minimum of turns to maintain high water pressure. Usually, the branch lines which lay between the supply line and the hydraulic giants were of small-diameter pipe. Like ditches, supply pipe abandoned by earlier miners was reportedly available and reused at all placer mining districts in the West during the 1930s and possibly earlier.[42]

Mining Pit

Hydraulic giants or monitors were the devices at the ends of the branch pipes where water was discharged at high pressure. They were the workhorses of the hydraulic mining operations, caving placer deposits in the mining pits and washing them into sluices. By the late nineteenth century, the giant's basic configuration had been standardized. It consisted of two steel, elbow sections bolted together with a long barrel attached to the uppermost elbow section and a nozzle at the end of the barrel. It could be rotated horizontally 360° and vertically slightly above and below the horizontal position. Built in one of ten sizes, most were of the smaller variety with pipe inlet diameters of 5 to 11 inches. All those reported in accounts of hydraulic mining operations at Leesburg were Nos. 1 to 4, i.e., those having 7 to 11 inch diameter inlet pipes. A weight of the giant's barrel and nozzle was counterbalanced by a box of rocks which was positioned above the branch pipe where it entered the giant and was attached to the giant via a piece of lumber which rested on the barrel and upper elbow section. A larger giant might also have had a deflector attached to the nozzle. The deflector was a second nozzle attached just beyond the first and operated by a short section of pipe. It allowed the pipeman to move the giant with ease using the water pressure inside the nozzles.[43]

Where there was an abundance of water, the work of loosening the ground in the mining pit may have been aided by the use of waterfalls. Ditches discharged directly into the pit, eroding small ravines along the top edge of the pit.[44]

Giants washed the water-saturated placer material into sluice boxes. Sluices usually either were cut into bedrock or were wooden troughs. In bedrock sluices, the material ran over natural ground (a form of ground sluicing) and the end-of-the-season clean-up involved picking between the rock to recover the placer gold. Usually the larger rock in the bedrock sluice had to be moved with a derrick during clean-up. Wooden sluice boxes were made in 10 to 14 foot long sections, and were between 1 and 5 feet wide and 8 inches to 2 feet deep. The sections usually telescoped together, i.e., the lower end of each section was narrower than the upper end of the next section. To preserve the sluice and to maximize gold recovery, riffles lined the bottom of the sluice box. Riffles were obstructions behind which the heavy gold fell as it washed down the sluice. Favored types were wooden blocks, rock, pole, wood bars topped with metal straps (Hungarian-type), angle iron, railroad iron, and fabric.[45]

One or more undercurrents may have been used toward the lower end of some sluices, especially when the gold was fine and therefore more difficult to recover. Washed material dropped through a grizzly (heavy grating) onto the undercurrent, also known as a table. The undercurrent was actually a wide, shallow sluice box, being four to ten times wider than the main sluice. The grade of the undercurrent lay perpendicular to that of the main sluice. The larger material which did not fall through the grizzly continued down the main sluice or fell into the waste dump.[46]

Sluices and undercurrents were periodically cleaned to recover the gold particles. Operators usually cleaned-out the upper portion of the sluice monthly and the lower portion only at the end of the season.

Hydraulic mining left large boulders behind which made maneuvering in the mining pit difficult. To clear the pit of boulders, operators usually employed derricks to pile the rock away from the giants and sluice boxes, although some rock was moved by hand, teams, winches, and later, dragline. Workers moved boulders onto a sling or stone boat and the derrick swung them over to a portion of the pit which had already been mined. Impact water-wheel or steam engines operated the derricks during the late nineteenth and early twentieth centuries; by the 1930s operators favored gasoline engines.[47]

Hydraulic elevators were occasionally used when there was not enough space in the mining pit to run the sluices or when waste material had to be dumped away from the end of the sluice. Water, sand, gravel, and rock entered the hydraulic elevator either at one side via a sluice box or from a sump. At the point of entry was a nozzle or jet which forced the material up through the elevator, a steel pipe. Depending on the size of the elevator and the head available, the device lifted material as high as 70 feet above the sluice or sump.[48]

In the 1920s and 1930s, several operators in the Intermountain West used a device called a Ruple elevator, which also moved waste away from the pit although it was not a true hydraulic elevator. A giant forced excavated material up the ruple which was a long, inclined grizzly. The fine material fell through the grizzly into a sluice, while the giant forced the rock over the top edge of the elevator and onto the waste rock pile.[49]

Tailings Area

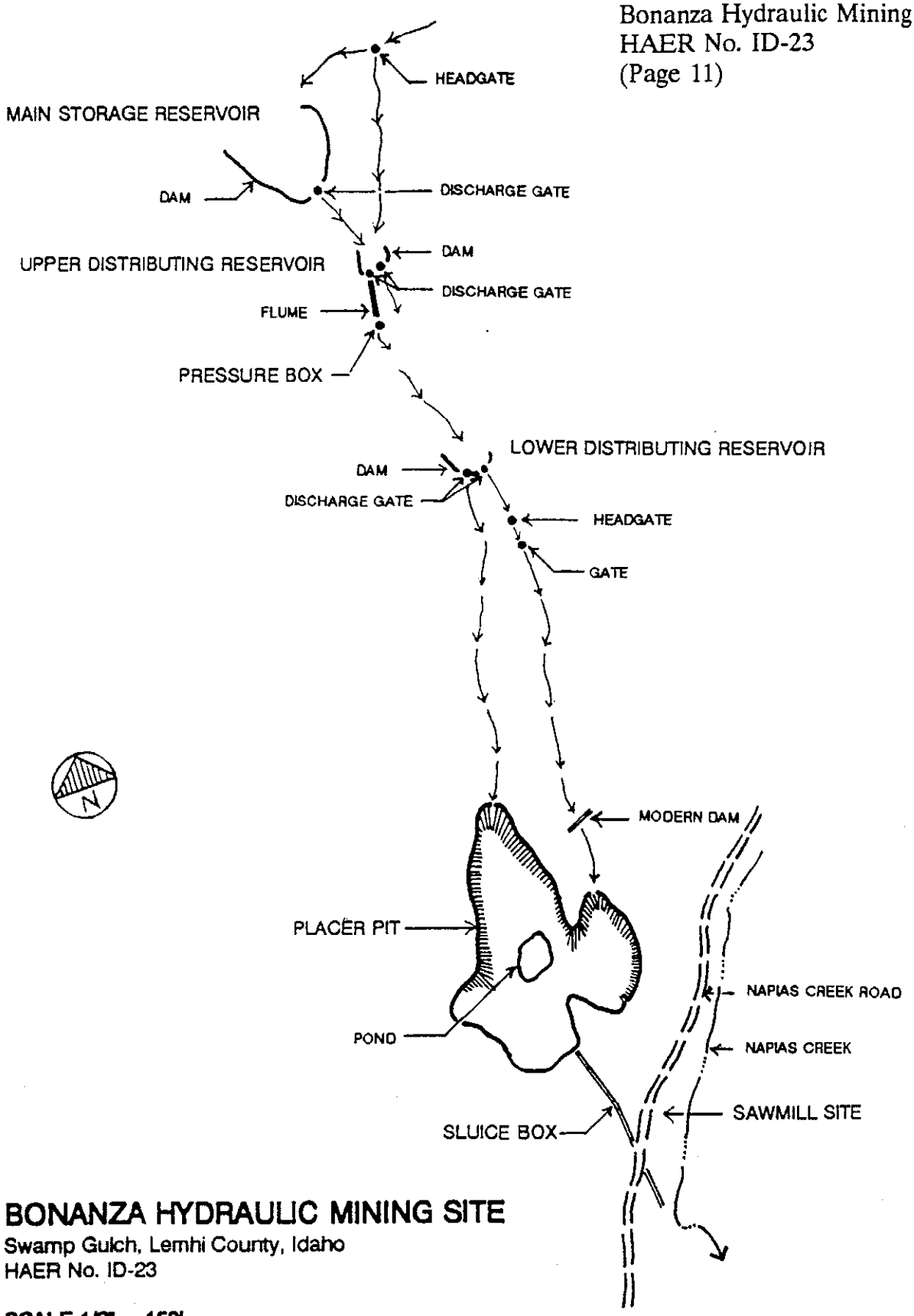
During the earliest years of hydraulic mining and even later in remote areas, operators were unconcerned about the disposal of waste material. However, where waste was carried by flood water to agricultural or other valuable property downstream from the mine, legislation eventually forced operators to take greater care in disposal methods. As mentioned previously, a hydraulic elevator might have elevated the tailings above the floodplain onto previously worked or sterile ground. Some operators elected to build brush or log dams below the tailings area which reduced the amount of material washed downstream.[50] Presumably because of Leesburg's remote location, most tailings appear to have been left where they were first dumped, i.e., along streambeds, especially Napias Creek.[51]

IV. DESCRIPTION OF THE BONANZA HYDRAULIC MINING SITE

The Bonanza Hydraulic Mining Site consists of three reservoirs, connecting flume and ditches with headgates, a pressure box, a two-lobed placer pit, a sluice box, and an associated sawmill, all situated within the drainage basin of Swamp Gulch.

Water for the system was diverted from Camp Creek, about 3500 feet east of the main storage reservoir (see below). The ditch, which today measures about 6 feet across the top and 3 feet deep, begins in a pond in a swampy area along Camp Creek about 250 feet due west of the east end of Leesburg's main street. No headgate is currently visible. Leaving the creek, the ditch curves around the edge of the steep hillside which rises immediately to the west, cutting through the Leesburg cemetery.[52] Just past the cemetery, another ditch which diverted water from Camp Creek intersects the Bonanza Placer, Inc. ditch, and may have supplemented its flow. The Bonanza Placer ditch continues west approximately along the 6640 foot contour, across an unnamed gulch and Jefferson Creek, and through a recent clear-cut. Near the west edge of the clear-cut, the Swamp Creek ditch branches from the main ditch, heading south and southwest for about 650 feet, at which point it enters the main storage reservoir. It is about 3 feet 6 inches wide at the top and about 18 inches deep.

The main storage reservoir measures approximately 128 feet north-south by 115 feet east-west (HAER photograph ID-23-A-1 and A-2). The dam is a combination timber crib and earthen dam; cribbing is visible under dirt and rock on the downstream



BONANZA HYDRAULIC MINING SITE

Swamp Gulch, Lemhi County, Idaho
HAER No. ID-23

SCALE 1/2" = 150'

side of the dam on either side of the discharge gate. It has a maximum height of 9 feet 10 inches and a maximum basal width of 19 feet 6 inches. It is U-shaped in plan. The discharge gate, located at the approximate center of the dam, has collapsed and its original configuration is difficult to determine (HAER photograph ID-23-A-3). However, it appears that the downstream gate opening measured at least 2 feet 8 inches square. The chute or flume which formed the downstream end of the gate was made of 2 x 8 lumber and measured 5 feet long by 2 feet wide.

The water passed through the discharge gate into a ditch which lay more or less perpendicular to the gentle slope of the land (HAER photograph ID-23-B-1). It runs 188 feet from the discharge gate to the dam at the upper distributing reservoir.

The upper distributing reservoir is a comparatively small impoundment, measuring about 40 feet in diameter. The earthen dam at the reservoir is 3 feet 6 inches tall at its highest point. Like the dam at the main reservoir, it is roughly U-shaped in plan. The south, west, and southeast walls are well-defined by embankments, but the upper end of the east wall is not. It is at this location that a second ditch entered the reservoir. A wooden wall of at least five 2 x 8s set on edge and supported by vertical posts retains the earth fill at the southwest corner of the dam on the downstream side only. The wall stood at least 3 feet tall originally.

The second ditch mentioned above, which is wider and shallower than the main ditch, diverted water from the main ditch about 200 feet above the main reservoir. A simple headgate controlled the flow of water into this second ditch.

There are two discharge gates at the upper distributing reservoir, separated by about 20 feet. The first, which is the farthest east of the two, may actually be a wasteway gate. It is wooden, but too collapsed to describe in further detail. From this gate water was discharged into a ditch which measures about 4 feet wide and 18 inches deep. It ends about 75 feet below the dam. The ditch was scoured at the gate outlet.

Water passing through the westernmost gate discharged directly into a 65-foot long, slightly elevated, wooden flume (HAER photograph ID-23-C-1). This structure has completely collapsed, but the remains show that it was about 3 feet wide and 2 feet 2 inches deep. Vertical bracing made of 2 x 4s with 1 x 6 sway bracing supported the flume, which rested on log cribs positioned on about 12-foot centers.

Water in the flume emptied into a wooden pressure box, the bottom of the flume lying 3 feet 4 inches above the bottom of the box. The pressure box measures 6 feet wide by 8 feet long and 5 feet 4 inches high (HAER photograph ID-23-C-2). It is constructed of 1 x 8 boards with interior battens nailed horizontally to 4 x 4 posts set at the corners and center of each long side. The entire structure is held together with ½

inch rods which run the width of the box and are bolted through the 4 x 4 posts. It has a wooden floor, but no roof. Inside is a baffle of rough, vertically-placed poles standing about 3 feet 4 inches from the lower end of the pressure box. This structure apparently served as a trash rack. At the downstream end of the pressure box is a 36 inch-diameter opening where, presumably, a steel thimble was once situated. The thimble would have connected with a steel supply pipe, also no longer present, which delivered water to the hydraulic giant(s).

There is a small ditch along the west side of the flume which begins from beneath the flume about 30 feet below the dam. Downstream from the pressure box, it joins with a ditch which runs downhill from the box. The ditch below the pressure box often appears more as a small gully than a ditch.

The lower distributing reservoir lies about 450 feet below the upper distributing reservoir. It is also a timber crib and earth fill structure which measures about 46 feet long by 60 feet wide. The embankment is primarily confined to the west and south sides of the reservoir; apparently the slope of the land along the other sides was sufficient to retain water on the east and north. The dam has two discharge gates. The gate farthest to the east is made of 1 x 6 boards. is about 2 feet on a side, and runs 6 feet long through the embankment. The westernmost gate is so badly collapsed that nothing of its original configuration could be determined.

Water passing through each gate emptied into a ditch, the easternmost passing through two more gates before entering a deep, narrow ditch which eventually discharged at the placer mine site. The first gate, situated about 120 feet downstream, is a simple, wooden headgate. The other gate, 60 feet farther downstream, lies at the top of a small earthen dam which is about 17 feet long, 4 feet wide, and 3 feet 6 inches high. The gate is 18 inches wide. At the top of the gate is a pair of wooden, king post trusses made of 4 x 4s (HAER photograph ID-23-D-1). The trusses may have held the control mechanism for the gate. The ditch has been badly scoured immediately below the dam.

Below this dam and gate, the ditch is up to 7 feet deep and 10 feet wide at its top. The ditch runs about 700 feet to the top edge of the placer pit below. Just above the point where the ditch enters the pit. an earthen dam has been built across the ditch. The location of the dam, the size of the fill, and the absence of a discharge gate indicates that the structure post-dates the Bonanza hydraulic mining operation. A metal scraper or stone boat below the dam at the mouth of the ditch might also post-date the late 1920s placering episode.

The westernmost ditch which begins at the lower distributing reservoir runs into the gully at the bottom of Swamp Gulch about 250 feet below the dam. The distance between the lower reservoir and the upper edge of the placer pit is about 800 feet.

The placer pit consists of two lobes, the smaller one on the east measuring about 125 x 325 feet top edge to edge, and the larger about 200 x 500 feet edge to edge (HAER photograph ID-23-E-1 and E-2). Near the upper end of the larger lobe is a pond which measures 60 x 70 feet. While its position in the placer pit suggests that it was deliberately created as part of the placering operation, there is no obvious evidence that the pond is man-made.

Near the downhill (Napias Creek) end of the placer pit are the remains of the sluice box (HAER photograph ID-23-F-1 to F-3). Two short, linear mounds of rock on either side of a small trough mark the route of the box. These mounds apparently represent the discarded gravels manually removed from the sluice box. The trough marks the approximate center of the sluice box, of which only scattered pieces remain. Lying on the mounds of rock are short sections of logs, each about 5 inches tall and up to 9 inches in diameter. These are the block riffles which were discarded from the sluice box during a clean-up.

Near the downstream end of the sluice box, the structure is better preserved than elsewhere and its size and construction can be determined. The inside width of the box is 2 feet 4 inches. The long walls of the box are double, with the outside constructed of 1 x 6 boards and the inside with heavier lumber, probably 2 inches thick. The sluice is supported by 4 x 4 posts set on about 3-foot centers. At this location, the sluice box is full of rock, which may have served as riffles.

The sluice box ends at a tall pile of placer tailings on the west side of Napias Creek. These tailings are apparently the remains of a subsequent placering operation along the creek.[53] However, the position of the end of the sluice box indicates that Bonanza dumped its tailings directly into Napias Creek.

One section of hydraulic pipe lies in the placer pit near the mouth of Swamp Gulch. It is a 20-foot long section of pipe, 7 inches in diameter. It is made of 5-foot long sections of 1/16-inch steel pipe welded together. It has been repaired with rubber tape and tar.

The last structure of the Bonanza operation is the sawmill site (see HAER photograph ID-23-G-1 and G-2). The site has been disturbed by maintenance of the Napias Creek Road, but a small dirt and rock platform and some possible log sills mark the location of one or more buildings. On the sloping ground between these foundations and Napias Creek are scrap slabs and waney-edge lumber rejected at the sawmill. Below and now partially lying in the creek, is a pile of stickered lumber, i.e., lumber piled to air-dry.

The physical remains at the Bonanza Hydraulic Mining Site roughly correlate with the improvements made by Bonanza Placer as documented in historic records and photographs. There are a few discrepancies and unusual design features, however. The main storage and upper and lower distributing reservoirs identified in the field are apparently the large storage reservoir and two of the three automatic reservoirs which Bonanza is said to have constructed in Swamp Gulch. The location of the third automatic reservoir was not determined, however. Another discrepancy between the written record and physical remains is the presence of a pond in the placer pit. Because of its location, it would not have functioned as the third automatic reservoir, but historic accounts do not mention it or an alternate function. Finally, the presence of a pressure box **above** the lower distributing reservoir is an arrangement inconsistent with standard hydraulic mining operation design. Typically, hydraulic pipe is attached to the box; thereafter, water is confined to the pipe. The pipe does not discharge into another reservoir, as the arrangement at the Bonanza Site indicates. The unusual arrangement in Swamp Gulch might be explained by progressive development and adjustments made to the water delivery system. The location of the pressure box below the upper distributing reservoir suggests that the lower dam was abandoned at some point in time and the pressure box built at the upper reservoir then.

V. FUTURE OF THE PROPERTY

The Bonanza Hydraulic Mining Site lies within the impact area of a large open-pit mining operation proposed by Meridian Gold Company and known as the Beartrack Gold Project. The property will be completely destroyed in the process of building the heap leach pad for the project. Until last winter, Meridian was prepared to begin construction of the Beartrack facility in 1993, but has recently placed the project on-hold.

The Bonanza Hydraulic Mining Site was determined eligible for listing in the National Register of Historic Places by consensus between the Salmon National Forest and the Idaho State Historic Preservation Office. As specified by a Memorandum of Agreement signed on August 2, 1991, this HAER document has been prepared as mitigation for the destruction of the property. Readers are referred to three other documents, "Gold Dust Mine, Mill, and Camp" (HAER No. ID-24), "Leesburg Mining District" (HAER No. ID-25), and "Leesburg Townsite" (HABS No. ID-106), which have been prepared for other properties in the Leesburg Basin, as stipulated in the August 2 Memorandum of Agreement.

VI. ENDNOTES

1. U.S. Department of the Interior, Geological Survey, "Geology and Ore Deposits of Lemhi County, Idaho," by Joseph B. Umpleby, U.S. Geological Survey Bulletin 528. (Washington, D.C.: Geological Survey, 1913), 148.

2. Several authors have written of the early history of the Leesburg Basin, including George E. Shoup, History of Lemhi County (Salmon: Salmon Recorder Herald, 1940, reprint Boise: Idaho State Library, 1969, page numbers refer to reprint edition); Orion E. Kirkpatrick, History of the Leesburg Pioneers (Salt Lake City: Pyramid Press, 1934), 23-25; Idaho Bureau of Mines and Geology, "Gold Camps and Silver Cities," by Merle W. Wells, Idaho Bureau of Mines and Geology Bulletin 22 (Moscow: Idaho Bureau of Mines and Geology, 1983), 67-72; A. Dudley Gardner, "Cultural Setting," in "A Cultural Resources Inventory of the Meridian Gold Company Beartrack Project, Lemhi County, Idaho," by Michael R. Polk (Ogden, Utah: Sagebrush Archaeological Consultants, 1991), 11-41; Robert R. Kautz, Dan Scurlock, and Amy C. Earls, "Research Design and Methods," in "Cultural Resources Investigations of Leesburg and Vicinity, Lemhi County, Idaho: Draft," (Austin, Texas, and Reno, Nevada: Mariah Associates, 1992), 10-20. Note that Kirkpatrick and Shoup provide two different dates for the original discovery, the former July 16 and the latter August 12.

3. Wells, "Gold Camps," 71. See Idaho Bureau of Mines and Geology.

4. Several other small mining companies, more partnerships than anything else, have been reported in these sources: "Leesburg," The (Salmon) Idaho Recorder, 26 March 1890, 3; Bannock Post, 9 February 1867, 2, cited in Gardner, "Cultural Setting," 20; Wells, "Gold Camps," 72. See Idaho Bureau of Mines and Geology; Brian Shovers and Lynn Fredlund, "Cultural Resources Inventory and Evaluation: Beartrack Prospect, Leesburg, Idaho," (Butte, Montana: GCM Services Inc., 1989), 5. Kirkpatrick, Leesburg Pioneers, 74-75, 92, 106 identified a few nineteenth century hydraulic mining operations.

5. "Leesburg;" Shoup, History of Lemhi County, 6; Wells, "Gold Camps," 72. See Idaho Bureau of Mines and Geology; Dan Scurlock, Susan Perlman, and Amy Earls, "Demographics," in "Cultural Resources Investigations of Leesburg and Vicinity, Lemhi County, Idaho," (Austin, Texas, and Reno, Nevada: Mariah Associates, 1992), 385.

6. Dan Scurlock, Amy Earls, and Jason D. Marmor, "Socio-Political Organization," in "Cultural Resources Investigations of Leesburg and Vicinity, Lemhi County, Idaho: Draft," (Austin, Texas, and Reno, Nevada: Mariah Associates, 1992), 345.

7. Idaho Bureau of Mines and Geology, "Reconnaissance Geology of the Leesburg Quadrangle, Lemhi County, Idaho," by Philip N. Shockey. Idaho Bureau of Mines and Geology Pamphlet 113 (Moscow: Idaho Bureau of Mines and Geology, 1957), 32-33; Gardner, "Cultural Setting," 32; Umpleby, "Ore Deposits of Lemhi County," 152-153. See U.S. Department of the Interior; Mineral Resources of the United States, (Washington, D.C.: U.S. Geological Survey, 1921 and 1922).

8. Census records indicate that Leesburg's population was significantly smaller throughout the twentieth century than it was at any time between 1870 and 1900; Scurlock, "Demographics," 385.

9. Gardner, "Cultural Setting," 34, citing the Engineering and Mining Journal (13 January 1917, 95-96; and 19 November 1898), mentions both 1896 and 1898 as start-up dates for the Moose Creek dredge. S.H. Lorain and O.H. Metzger report an 1899 start date and a 1919 end date in U.S. Department of the Interior, Bureau of Mines, "Reconnaissance of Placer-Mining Districts in Lemhi County, Idaho," U.S. Bureau of Mines Information Circular 7082 (1939), 57.

10. Gardner, "Cultural Setting," 34; however, the Engineering and Mining Journal (10 March 1928), 429 reported that $1 million was produced at the Moose Creek placers by hydraulicking and only $½ million by dredging.

11. Idaho Bureau of Mines and Geology, Inspector of Mines, Annual Reports of the Mining Industry of Idaho (1910-1955); U.S. Department of Commerce, Bureau of Mines, Mineral Resources of the United States (1908-1924); U.S. Department of Commerce, Bureau of Mines, Mineral Resources of the United States (Washington, D.C., Bureau of Mines, 1925-1932); U.S. Department of Commerce, Bureau of Mines, Minerals Yearbook (Washington, D.C.: Bureau of Mines, 1934-1955).

12. Wells, "Gold Camps," 67. See Idaho Bureau of Mines and Geology; Shoup, History of Lemhi County, 6, 12.

13. "Leesburg," The (Salmon) Idaho Recorder, 9 July 1926, 8; "Mining Men Locate Placers Rapps Creek near Leesburg," The (Salmon) Idaho Recorder, 30 July 1926, 1; "Lemhi County Mining Claims" Book W, 81-84, 93-94, 116 (location certificates for the Bonanza, Bonanza King, Bonanza No. 2, Bonanza No. 3, Bonanza No. 4, Bonanza Queen, and Bonanza Princess placers).

14. "Salmon Local Notes," The (Salmon) Idaho Recorder, 13 August 1926, 5; "Lemhi County Mining Claims" Book W, 81-84, 93-94, 115-117, 169; "Lemhi County Deed Record Mining" Book T, 589, 592, 596.

15. Idaho Secretary of State, "Articles of Incorporation" of Bonanza Placer, Inc.," 4 October 1926, located at Idaho Secretary of State's Office, Boise; "Leesburg Placers Hydraulic Mined," (Salmon) Recorder Herald, 1 July 1927, 1; "Bonanza Placer Making Headway Washing Gravel," (Salmon) Recorder Herald, 2 September 1927, 1.

16. "Lemhi County Mining Claims" Books R and W.

17. "Leesburg," The (Salmon) Idaho Recorder, 25 March 1927, 8; "Leesburg Placer Mining Reviving," (Salmon) Recorder Herald, 6 May 1927, 1; "Bonanza Placer Piping for Gold On Swamp Gulch," (Salmon) Recorder Herald, 29 July 1927, 1; "Lemhi County Deed Record" Book 29, 239 (bill of sale between Bonanza Placer, Inc. and the Leesburg Bonanza Placer Company); Idaho Bureau of Mines and Geology, Twenty-eighth Annual Report of the Mining Industry of Idaho for the Year 1926, 152; "Bonanza Placers Now Working Three Shifts," Lemhi County Recorder Herald, 9 May 1928, 1.

18. "Leesburg Placer Mining Reviving;" "Bonanza Placer Piping for Gold on Swamp Gulch;" "Bonanza Placer Making Headway Washing Gravel;" "Early Freeze Stops Placer Operations," (Salmon) Recorder Herald, 19 October 1927, 5; "Old Mines are Opened Again," (Salmon) Recorder Herald, 29 July 1927, 1; Idaho Bureau of Mines and Geology, Inspector of Mines, Twenty-ninth Annual Report of the Mining Industry of Idaho for the Year 1927, 158.

19. "Bonanza Placer Piping for Gold on Swamp Gulch;" "Bonanza Placer Making Headway Washing Gravel;" "Early Freeze Stops Placer Operations;" "Lemhi County Deed Record" Book O, 634, and Book 28, 481 (title for water rights on Camp Creek). The main ditch from Camp Creek was apparently the improvement of an earlier ditch used to supply water to Red Gravel Bar, placer mining ground on the west side of Napias Creek between Jefferson Creek and Swamp Gulch. Frank A. Butschke acquired the ditch and associated water rights from O.E. Kirkpatrick in July, 1926, and later transferred the property to Bonanza Placer; "Lemhi County Deed Record" Book 0, 634, 25 July 1926; Book 28, 481, 15 December 1926. There may have been a storage reservoir on Camp Creek, but today that site just appears to be a small pond with no apparent embankment.

20. "Bonanza Placers Now Working Three Shifts."

21. "Bonanza Placer Official Looks at Season's Work," Lemhi County Recorder Herald, 17 October 1928, 2.

22. Lemhi County, "Articles of Incorporation" of the Leesburg Bonanza Placer Company," 5 February 1929, located at the Lemhi County Courthouse, Salmon; Idaho Bureau of Mines and Geology, Thirty-Second Annual Report of the Mining Industry of Idaho for the Year 1930, 182; "Lemhi County Deed Record" Book 29, 237 (transfer of 10 placer claims from Bonanza Placer to Leesburg Bonanza); "Leesburg to See Very Extensive Placer Washing," Lemhi County Recorder Herald, 21 March 1928, 1.

23. "Placer Company President Arrives to Begin Operation," Lemhi County Recorder Herald, 10 April 1929, 1.

24. Mineral Resources of the United States (1929), 394. See U.S. Department of Commerce.

25. Mineral Resources of the United States (1930), 642. See U.S. Department of Commerce.

26. Idaho Bureau of Mines and Geology, Inspector of Mines, Annual Reports of the Mining Industry of Idaho (1932-1935); "Lemhi County Proof of Labor" Book I, 401, 471, 542, 546.

27. "Lemhi County Index to Proof of Labor" Book 5 A-L.

28. "Lemhi County Deed Record" Book 34, 255, 301, (quit-claim deeds transferring 10 placer claims, water rights, and improvements from Leesburg Bonanza to Mary Therkelsen). Assessment work in 1939, apparently the last year that Therkelsen did any work at all on the claims, consisted of "digging about 12 pits to bed rock on the Gem placer and Betty Catherine placer claims, testing ground on the Bonanza, Bonanza No. 2, Bonanza No. 3, Bonanza No. 4 placer claims. Fixing roads and trails on the Prince, Princess and King claims. Sampling ground on the Queen and Crown claims." "Lemhi County Proof of Labor" Book H, 145.

29. Idaho Bureau of Mines and Geology, Inspector of Mines, Forty-first Annual Report of the Mining Industry of Idaho for the Year 1939, 233.

30. Lorain and Metzger, "Placer-Mining Districts in Lemhi County," 46-47. See U.S. Department of the Interior.

31. Shockey, "Geology of the Leesburg Quadrangle," 37. See Idaho Bureau of Mines and Geology.

32. A Treatise on Metal Mining, vol. III (Scranton, Pennsylvania: Colliery Engineer Co., 1899), chap. 38, 29.

33. Eugene B. Wilson, Hydraulic and Placer Mining, 3rd ed. (New York: John Wiley & Sons, 1918), 174-175, 210; A Treatise on Metal Mining, chap. 38, 29-32.

34. U.S. Department of the Interior, Bureau of Mines, "Placer Mining in the Western States, Part II," by E.D. Gardner and C.H. Johnson, U.S. Bureau of Mines Information Circular 6787 (1934), 34-35; U.S. Department of the Interior, Bureau of Mines, "Placer Mining in the Western United States, Part III," by E.D. Gardner and C.H. Johnson, U.S. Bureau of Mines Information Circular 6788, (1935), 51.

35. United State Department of the Interior, Bureau of Mines, "Placer Mining in the Western States, Part 1," by E.D. Gardner and C.H. Johnson, U.S. Bureau of Mines Information Circular 6786 (1934), 5.

36. William E. Thorne and A.W. Hooke, Mining of Alluvial Deposits by Dredging and Hydraulicking (London: Mining Publications, 1929), 44-48; Wilson, Hydraulic and Placer Mining, 152-153, 163-173, 190-204; Gardner and Johnson, "Placer Mining, Part II," 4-12; A Treatise on Metal Mining, chap. 38, 53-54, 76-82.

37. Gardner and Johnson, "Placer Mining, Part II," 4. See U.S. Department of the Interior.

38. Gardner and Johnson, "Placer Mining, Part II," 9. See U.S. Department of the Interior. Hydraulic miners working in the 1930s and possibly earlier often reused older ditch systems, improving them for their own operations; Gardner and Johnson, "Placer Mining, Part II," 37. See U.S. Department of the Interior.

39. A Treatise on Metal Mining, chap. 38, 54-61; Gardner and Johnson, "Placer Mining, Part II," 12-13. See U.S. Department of the Interior.

40. A Treatise on Metal Mining, chap. 38, 55.

41. A Treatise on Metal Mining, chap. 38, 89-90; Thorne and Hooke, Mining of Alluvial Deposits, 38-41; Wilson, Hydraulic and Placer Mining, 188-189.

42. Gardner and Johnson, "Placer Mining, Part II," 13-14. See U.S. Department of the Interior.

43. A Treatise on Metal Mining, chap. 38, 30-33; Wilson, Hydraulic and Placer Mining, 210-214; Gardner and Johnson, "Placer Mining, Part II," 20-22. See U.S. Department of the Interior.

44. A Treatise on Metal Mining, chap. 38, 94; Wilson, Hydraulic and Placer Mining, 58, 226.

45. A Treatise on Metal Mining, chap. 38, 16-22; Gardner and Johnson, "Placer Mining, Part II," 40, 66-73. See U.S. Department of the Interior; Wilson, 72-80; Thorne and Hooke, Mining of Alluvial Deposits, 59-71.

46. A Treatise on Metal Mining, chap. 38, 22-25; Gardner and Johnson, "Placer Mining, Part II," 73-74. See U.S. Department of the Interior; Wilson, Hydraulic and Placer Mining, 145+.

47. A Treatise on Metal Mining, chap. 38, 38; Gardner and Johnson, "Placer Mining, Part II," 39. See U.S. Department of the Interior; Gardner and Johnson, "Placer Mining, Part I," 66. See U.S. Department of the Interior.

48. Thorne and Hooke, Mining of Alluvial Deposits, 74-85; Wilson, Hydraulic and Placer Mining, 214-226; A Treatise on Metal Mining, chap. 38, 36-38; Gardner and Johnson, "Placer Mining, Part II," 23. See U.S. Department of the Interior.

49. Gardner and Johnson, "Placer Mining, Part II," Fig. 9, 23. See U.S. Department of the Interior.

50. Thorne and Hooke, Mining of Alluvial Deposits, 87-88; A Treatise on Metal Mining, chap. 38, 36; James D. Stewart, "Is Agriculture to Continue to Restrict Hydraulic Mining in California?," Engineering and Mining Journal 125, no. 23 (9 June 1928), 928-931.

51. Jason D. Marmor and others, "Mining Technology," in "Cultural Resources Investigations of Leesburg and Vicinity, Lemhi County, Idaho: Draft," (Austin, Texas, and Reno, Nevada: Mariah Associates, 1992), 303.

52. See Mitzi Rossillon, "Leesburg Townsite," Historic American Buildings Survey No. ID-106, San Francisco, National Park Service, 1992.

53. The tailings are the remains of the Alaska Idaho Mining Company dragline operation; Shockey, "Geology of the Leesburg Quadrangle," 37. See Idaho Bureau of Mines and Geology.

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